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ART. VI.—Notes on Plant Remains from Narracan and Darlimurla, South Gippsland.

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(With 2 plates.)

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**Source of the Material.**

Of the leaf-remains described, some of the specimens were collected by Mr. F. A. Cudmore, and presented to the National Museum in October, 1919. Others were obtained during January, 1934, by the writer.

Through the courtesy of Mr. Carruthers, access was given to the outcrop of plant-bearing beds near Dixon's Creek, which runs east, and joins the 10-mile creek about  $\frac{1}{2}$  mile below his homestead.

The leaf beds occur near the summit of a high hill covered with dense undergrowth, in dark sandstone underlying the Older Basalt. Some of the leaf impressions are particularly clear, and the venation well-defined. A small collection of leaves from this area (Narracan) was earlier described by F. Chapman in 1926.

From the ligneous clay at Darlimurla, Gippsland, some finely veined and well-preserved leaf impressions were found by Mr. J. Wright in 1882. These specimens were forwarded to the Mines Department by Mr. W. H. Ferguson, and by the desire of the Director of the Geological Survey, Mr. Baragwanath, I have included them in this paper. These leaf beds lie under the Older Basalt, and according to Mr. F. Chapman, are probably of Oligocene age.

**I. Fossil Leaves from Narracan.**

ANGIOSPERMEAE (DICOTYLEDONES).

Family STERCULIACEAE.

Genus **Sterculia** Linné.

*Sterculia* cf. *gippslandica* Chapman, fig. 1.

*Sterculia* sp. Chapman, 1921, p. 118, pl. xii, fig. 1.

*S. gippslandica* Chapman, 1926, p. 184, pl. xii, fig. 1.

Observations.—The present is a distinctly trilobate leaf, measuring 75 mm. long, 68 mm. wide, with margins incomplete; petiole thick.

A fragment of a smaller leaf showing a thick petiole, trilobate form and palmate veining, somewhat resembles Ettingshausen's *Acer subintegrifolium* (1888, p. 159, pl. xiv., fig. 1).

Genus **Brachychiton** Schott.

cf. BRACHYCHITON POPULNEUS. R. Brown. Fig. 2.

Observations.—A well-preserved leaf resembling that of the present day Currajong, with an entire margin, ovate lanceolate in shape, 75 mm. long and about 30 mm. wide. The petiole was apparently long, mid-rib strong, the secondary veins curve, divide at the margin, and anastomose with those above. Tertiary veins finely reticulate.

## Family FAGACEAE.

Genus **Nothofagus** Blume.

NOTHOFAGUS MAIDENI (Deane).

*Fagus Maideni* Deane, 1902, p. 30, pl. vii., fig. 10.*Nothofagus Maideni* Chapman, 1921, pl. viii., fig. 3 Paterson, 1934, p. 265, pl. xiii., fig. 3.

Observations.—Surface smooth and delicately textured, margin finely serrate, mid-rib straight, the lateral veins nearly so and end at the points of the teeth.

NOTHOFAGUS WILKINSONI (Ettingshausen). Fig. 3.

*Fagus Wilkinsoni* Ettingshausen, 1888, p. 32, pl. ii., fig. 1.

Observations.—In size and general characteristics this leaf resembles that described by Ettingshausen from Dalton, near Gunning, New South Wales.

## Family LAURINEAE.

Genus **Cinnamomum** Linné.

CINNAMOMUM POLYMORPHOIDES. var. CRASSA, nov. Figs. 5 and 6.

*Cinnamomum polymorphoides* McCoy, 1876, p. 31, pl. xl., figs. 1-3.Ettingshausen, 1888, p. 125, pl. xi., figs. 3-3a. Deane, 1902, p. 27, pl. 1, figs. 6, 12. Chapman, 1914, p. 90, figs. 61a; *idem*, 1926, p. 187, pl. xiii, fig. 10.

Observations.—The leaf impressions from this deposit show a variety of forms resembling *C. polymorphoides*. Some represent a smaller variety than yet recorded, ranging from 1 in. to  $1\frac{3}{4}$  in. in length, with exceptionally strong venation, and of coriaceous character.

Another good impression (Fig. 4) has affinity to *C. Burmanni*, figured by Deane (1901, Pl. XXXVII., Fig. 1). Two short lateral veins arise from the base, and pass to the leaf edge; above these is the characteristic 3-forked venation showing the two outer veins that continue to the apex, with small laterals extending to the margin. The tertiary veining is well marked. Leaf, circ. 2 in. long,  $1\frac{1}{4}$  in. wide.

Genus **Cryptocarya** R. Brown.

CRYPTOCARYA aff. AUSTRALIS Deane. Figs. 7, 13.

*Cryptocarya australis* Deane, 1901, pl. xxxvii., fig. 6.

Observations.—The upper and lower surfaces of a narrow leaf, 2 in. wide, and well preserved. Three principal veins of equal thickness diverge from the base, and run parallel with its length. The tertiary veining is tenuous, disposed almost at right angles to the midrib. These portions resemble the living species figured by Deane as *C. australis*, but are smaller.

Several globular shaped fossil fruits varying in size from  $\frac{1}{2}$  in. to circ.  $\frac{3}{4}$  in. long resemble those of the Species *Cryptocarya Murrayi* and *C. Mackinnoniana*.

Family PROTEACEAE.

Genus **Lomatia** R. Brown.

LOMATIA BROWNII Ettingshausen. Fig. 8.

*Lomatia Brownii* Ettingshausen, 1888, p. 135, pl. xii., figs. 4-5. Paterson, 1934, p. 266, pl. xiv., fig. 9.

Observations.—The specimen shows the upper and lower surfaces of a lanceolate leaf, circ. 75 mm. long and 26 mm. wide.

LOMATIA cf. RETICULATA Deane. Fig. 9.

*Lomatia reticulata* Deane, 1902, p. 28, pl. xiv., figs. 8, 9; pl. v., fig. 8.

Observations.—An incomplete firmly-textured leaf occurs, whose characters are similar to this species. Length, circ. 80 mm. when complete, width 30 mm. Teeth more widely spaced and irregular than in *L. Brownii*.

Genus **Persoonia** J. C. Smith. Figs. 14, 15.

PERSOONIA sp.

This shows the inner rough endocarp and the single seed of a drupaceous fruit,  $\frac{1}{4}$  inch long; it compares with dried specimens of *P. conferta*.

Family MYRTACEAE.

Genus **Tristania** R. Brown.

TRISTANITES ANGUSTIFOLIA Deane.

*Tristanites angustifolia* Deane, 1902, p. 23, pl. iii., fig. 1, pl. vi., fig. 7. Chapman, 1921, p. 118; 1926, p. 185, pl. xii., fig. 5.

Observations.—The upper and lower surfaces of a perfect leaf, circ. 2 in. long,  $\frac{1}{2}$  in. wide, occur here. The leaf is lanceolate with an entire edge and oblique base.

cf. TRISTANITES MUELLERI Deane. Fig. 10.

*Tristanites Muellerei* Deane, 1902, p. 23, pl. iii., fig. 2.

An incomplete leaf resembles this species; the lower part shows an intramarginal vein.

## Family MONOMIACEAE.

Genus **Hedycarya** Foster.

## HEDYCARYA LATIFOLIA Deane. Fig. 11.

*Hedycarya latifolia* Deane, 1902, p. 27, pl. vi, fig. 3. Chapman, 1921, p. 118; 1926, p. 186, pl. xiii., fig. 7.

Observations.—A large ovate leaf occurs, tapering at the base and with margins irregularly toothed. The midrib is strong and straight and the secondary veins proceed from it at an angle of about 50 deg., curving and dividing near the margin, and joining the one immediately above. The tertiary veins form a coarse network; the texture of the leaf is thick. Length, circ. 80 mm., width, circ. 45 mm.

## Family CASUARINACEAE.

Genus **Casuarina** Linné.

## cf. CASUARINA sp.

Observations.—Portion of a thin cylindrical branchlet occurs, which is longitudinally ridged, circ. 4 mm. wide, with internodes 2 mm. long. Ettingshausen records a branchlet of *C. Cookii* (1888, p. 107, Pl. 9, Figs. 3-3A) in the white pipeclay of Vegetable Creek. From Sentinel Rock, Cape Otway, Deane records a small forked branchlet. (1904, p. 214, Pl. XX., Fig. 19).

## Family TAXINEAE.

Genus **Podocarpus** L'Heritier.

## PODOCARPUS PRAECUPRESSIFORMIS. Ettingshausen. Fig. 12.

*Podocarpus praecupressiformis* Ettingshausen, 1888, p. 100, pl. viii., figs. 26, 26a, 27a. Deane, 1902 (2), p. 6, pl. xvi., fig. 6.

This specimen shows portion of a rachis or stem with stiff, flat, lineal leaves, grouped closely together. These narrow at the base, are bluntly pointed, and show a strong median nerve.

## Family LOGANIACEAE.

Genus **Strychnos** Linné.

Observations.—A large globular fruit, 1 in. across, though imperfect and flattened, resembles the capsule or berry of *Strychnos Nux-vomica*.

## II. Fossil Leaves from Darlimurla, Gippsland.

## Family STERCULIACEAE.

Genus **Sterculia** Linné 1747.

## STERCULIA cf. GIPPSLANDICA.

*Sterculia gippslandica* Chapman, 1926, p. 184, pl. xii., fig. 1.

Observations.—Two small and a larger portion of a trilobed leaf showing the outer ribs reduced to basal veins.

Family FAGACEAE.

Genus **Nothofagus** Blume.

NOTHOFAGUS MUELLERI. Ettingshausen. Fig. 16.

*Fagus Muelleri* Ettingshausen, 1888, p. 118, pl. x., figs. 3-7. Deane, 1902, p. 29, pl. vii, fig. 10.

Observations.—This leaf impression resembles those from Wilson's Quarry, Berwick, and from Vegetable Creek, New South Wales.

NOTHOFAGUS LUEHMANNI (Deane). Fig. 17.

*Fagus Luehmanni* Deane, 1902 (2), p. 30, pl. vii., figs. 5, 6, 7, 9.

Observations.—Leaves referred to the above species are of a smooth texture, ovate, oblique at base, the two sides of the lamina unequal. Margins prominently toothed, occurring at the end of the lateral veins, and also at intermediate points. Midrib and secondary veins straight or slightly curved. Length of leaf 50 mm.; twice as long as broad.

These impressions also show characters akin to the existing Antarctic Beech, *Nothofagus Moorei* (F. v. Mueller) figured by Maiden (see Forest Flora of N.S.W., Vol. 7, p. 365, 1922).

Family LAURACEAE.

Genus **Cryptocarya** R. Brown.

CRYPTOCARYA PRAEOBOVATA Deane. Fig. 18.

*Cryptocarya praeobovata* Deane, 1907, p. 3, pl. xxxiv., fig. 1.

Observations.—A fragment of a large leaf, circ. 3 inches long, 1½ inches wide. Apex pointed, surface smooth, margin entire; midrib strong, lateral veins vary from opposite to alternate, which near the margin curve and turn to meet the next above: tertiary veins at right angles to the midrib and coarsely reticulate. It agrees in the main with the characters of *C. obovata* R. Brown, but is more tapering at the apex. Deane figures a similar leaf from his Paper on Fossil Leaves from the Warrumbungle Mountains.

Family MYRTACEAE.

Genus **Eucalyptus** L'Heritier.

EUCALYPTUS KITSONI Deane.

*Eucalyptus Kitsoni* Deane, 1902, p. 25, pl. iv., figs. 5, 6, 7. Chapman, 1921, p. 118, pl. viii. fig. 9. *Ibid.*, 1926, p. 185, pl. xiii., fig. 6. Maiden, 1922, p. 188, pl. cccxiii., figs. 10a-c.

Observations.—Portions of several slender leaves occur in the sandstone. One complete leaf is 3 inches long and 10 mm. wide; the intra-marginal vein runs near the edge; lateral veins are close and proceed from the midrib at an angle of about 40°.

NOTE.—At the present stage of our knowledge it is impossible to ascribe definite ages to all the floras, but so far as possible they have been indicated in the last columns of the appended table by Mr. F. Chapman.

The plant remains occurring in the dark coloured sandstone at Narracan, and the finely grained clay at Darlimurla are similar to those of other localities, as Berwick, Bacchus March, Pitfield, Bogong, and Pascoe Vale, and show an almost synchronous type of flora. The vegetation somewhat resembles that of the present day in warmer latitudes where the conditions are warm and moist. The great variety of leaf impressions and fruits of the genus *Cinnamomum* and allied forms, now tropical in their distribution, particularly suggest that a much higher temperature then prevailed in Southern Australia than at the present day.

The family *Fagaceae* belongs to the Antarctic flora, but with the variation in climate it has wandered to warmer lands, and has been recorded from Vegetable Creek and Gunning, New South Wales, Tasmania, as also Victoria. To-day it flourishes as far north as the Macpherson Ranges, Queensland, and south to the Upper Gloucester River, New South Wales, and is represented by the stronger foliaged *Nothofagus Moorci*, with a leaf-blade 1 inch to 2½ inches long. In the cool valleys of Victoria and Tasmania this persists in *Nothofagus Cunninghamsi*, with a leaf blade 3-10ths—1 inch long. These variations in leaf size seem to show the effect of a more genial climate.

In conclusion, I would like to thank Messrs. F. Chapman and R. A. Keble for their advice in preparing this paper, and Messrs. C. W. Brazenor and A. A. C. Carter who kindly took the photographs.

### Table of Tertiary Plant Remains and their Distribution in Victoria.

Order and Genera.	Locality.	Probable Age.
		(By F. Chapman).
LAURINEAE— <i>Cinnamomum</i> —	Pitfield, Bacchus Marsh, Morwell.	Miocene.
	Narracan, Darlimurla, Berwick, Pascoe Vale, Mornington	L. Oligocene.
<i>Laurus</i> —	Bacchus Marsh.	Miocene.
	Dargon Plains, Pascoe Vale.	L. Oligocene.
<i>Cryptocarya</i> —	Narracan, Darlimurla	L. Oligocene.
STERCULIACEAE— <i>Sterculia</i> —	Pitfield,	Miocene.
	Narracan, Darlimurla.	L. Oligocene.
<i>Bombax</i> —	Pascoe Vale, Narracan.	L. Oligocene.
<i>Commerconia</i>	Berwick.	L. Oligocene.

TABLE OF TERTIARY PLANT REMAINS AND THEIR DISTRIBUTION  
IN VICTORIA—continued.

Order and Genera.	Locality.	Probable Age.
PROTEACEAE— <i>Banksia</i> ,		
<i>Dryandra</i> —	Morwell.	Miocene.
	Narracan.	L. Oligocene.
<i>Lomatia</i> —	Morwell.	Miocene.
	Berwick, Narracan, Pascoe Vale.	L. Oligocene.
<i>Persoonia</i> —	Sentinel Rock.	L. Miocene
<i>Phyllites</i> —	Sentinel Rock.	L. Miocene
	Berwick.	L. Oligocene.
MYRTACEAE— <i>Eucalyptus</i> —	Pitfield	Miocene.
	Berwick, Darlimurla.	L. Oligocene.
	Narracan, Dargo, Bogong.	
<i>Tristanites</i> —	Morwell.	Miocene.
	Berwick, Narracan.	L. Oligocene.
MONIMIACEAE— <i>Mollinedia</i> —	Pitfield	Miocene.
	Berwick, Narracan.	L. Oligocene.
<i>Hedycarya</i> —	Berwick, Narracan.	L. Oligocene.
<i>Daphnandra</i> —	Pitfield	Miocene.
	Berwick.	L. Oligocene.
<i>Athrosperma</i> —	Berwick.	L. Oligocene.
FAGACEAE— <i>Nothofagus</i> —	Berwick, Darlimurla, Narracan, Pascoe Vale.	L. Oligocene.
CASUARINEAE— <i>Causarina</i> —	Sentinel Rock. Narracan.	L. Miocene L. Oligocene.
SAPINDACEAE— <i>Nephelites</i> —	Pitfield	Miocene.
	Berwick, Pascoe Vale.	L. Oligocene.
<i>Carpolithes</i> —	Pitfield	Miocene.
	Berwick.	L. Oligocene.
CONIFERAE— <i>Phyllocladus</i> —	Morwell.	Miocene.
	Sentinel Rock.	L. Miocene
<i>Dammara</i> —	Berwick.	L. Oligocene.
<i>Ginkgo</i> —	Morwell. Dargo Plains.	Miocene. L. Oligocene.
SAXIFRAGEAE— <i>Weinmannia</i> —	Narracan.	L. Oligocene.
<i>Eucryphia</i> —	Pitfield	Miocene.
MOREAE— <i>Ficonium</i> —	Pascoe Vale, Narracan.	L. Oligocene.
<i>Ficus</i> —	Dargo, Bogong Plains.	L. Oligocene.
MAGNOLIACEAE— <i>Magnolia</i> —	Pascoe Vale, Narracan.	L. Oligocene.
<i>Drimys</i> —	Pitfield	Miocene.
RHAMNACEAE— <i>Pomaderris</i> —	Pascoe Vale, Narracan.	L. Oligocene.
BORAGINACEAE— <i>Cordia</i> —	Pascoe Vale, Narracan.	L. Oligocene.
PITTOSPORAE— <i>Pittosporum</i> —	Pitfield	Miocene.
ARALIACEAE— <i>Panacites</i> —	Pitfield	Miocene.
APOCYNACEAE—		
<i>Apocynophyllum</i> —	Berwick.	L. Oligocene.
MYRSINEAE— <i>Myrsine</i> —	Sentinel Rock.	L. Miocene
LEGUMINOSEAE— <i>Pultenaea</i> —	Sentinel Rock.	L. Miocene
RUBIACEAE—		
<i>Coprosmaephyllum</i> —	Sentinel Rock.	L. Miocene
TILIACEAE— <i>Aristolotelia</i> —	Berwick.	L. Oligocene.
FILICES— <i>Lastraca</i> —	Dargo, Bogong Plains.	L. Oligocene.


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## Explanation of Plates.

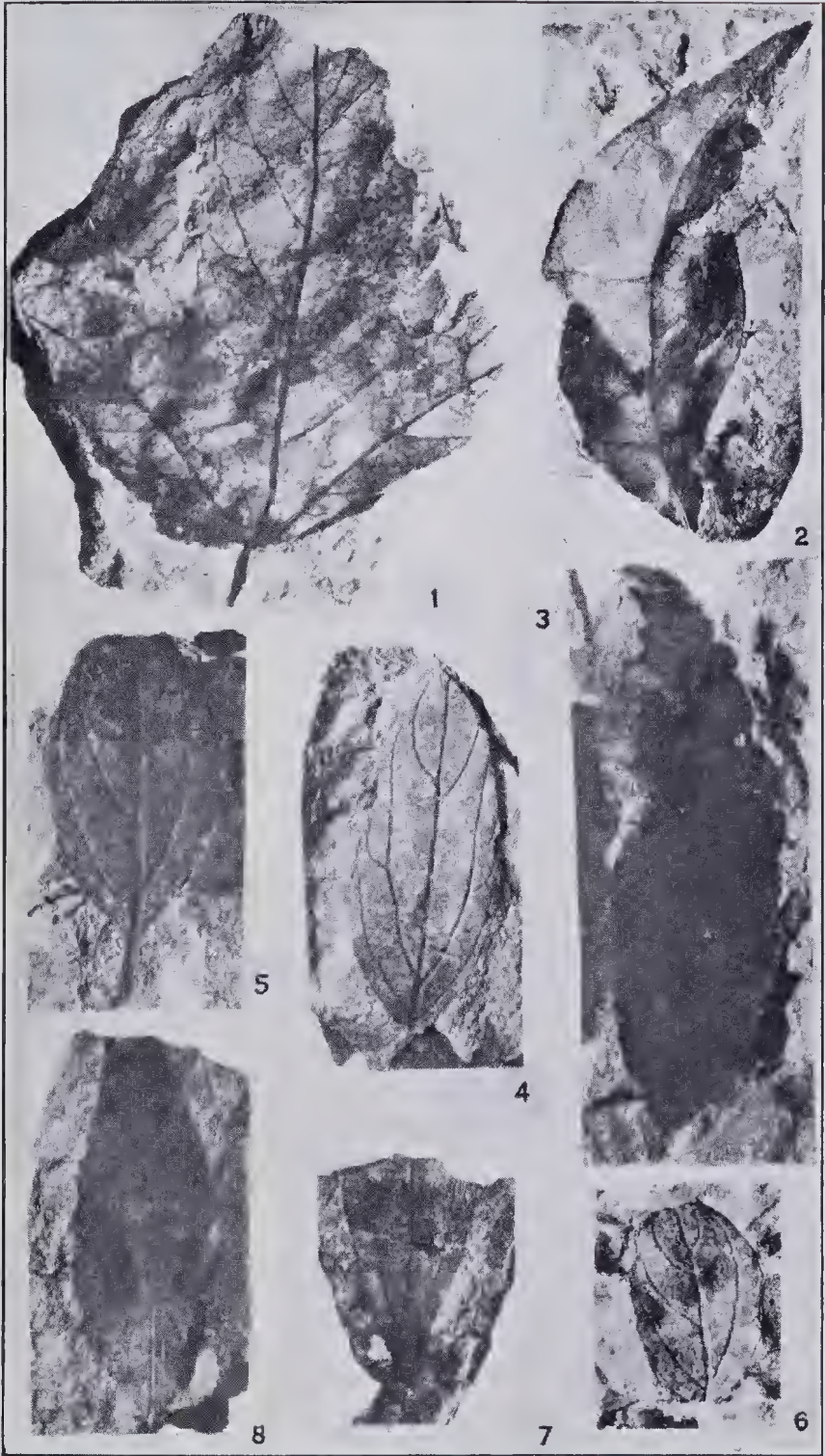
PLATE 

- Fig. 1.—*Sterculia* cf. *gippslandica* Chapman. Lower surface. Nat. size.
- Fig. 2.—cf. *Brachychiton populneus*. R. Brown. Nat. size.
- Fig. 3.—*Nothofagus Wilkinsoni* Ettingshausen. Nat. size.
- Fig. 4.—aff. *Cinnamomum Burmanni*. Deane. Nat. size.
- Figs. 5-6.—*Cinnamomum polymorphoides* McCoy. var. *crassa*, nov. Nat. size.
- Fig. 7.—aff. *Cryptocarya australis* Deane. Upper surface. Nat. size.
- Fig. 8.—*Lomatia Brozovii* Ettingshausen. Upper surface. Nat. size.

PLATE 

- Fig. 9.—*Lomatia* cf. *reticulata* Deane. Nat. size
- Fig. 10.—cf. *Tristanites Muellerei*. Deane. Nat. size.
- Fig. 11.—*Hedycarya latifolia* Deane. Nat. size.
- Fig. 12.—*Podocarpus praeocupressiformis* Ettingshausen. x. 4.
- Fig. 13.—cf. *Cryptocarya* sp. Fruit. Nat. size.
- Figs. 14-15.—cf. *Persoonia* sp. Fruits. Nat. size.
- Fig. 16.—*Nothofagus Muellerei* Ettingshausen. Nat. size.
- Fig. 17.—*Nothofagus Luchmanni*. Deane. Nat. size.
- Fig. 18.—*Cryptocarya praecoxulata*. Deane. Nat. size.

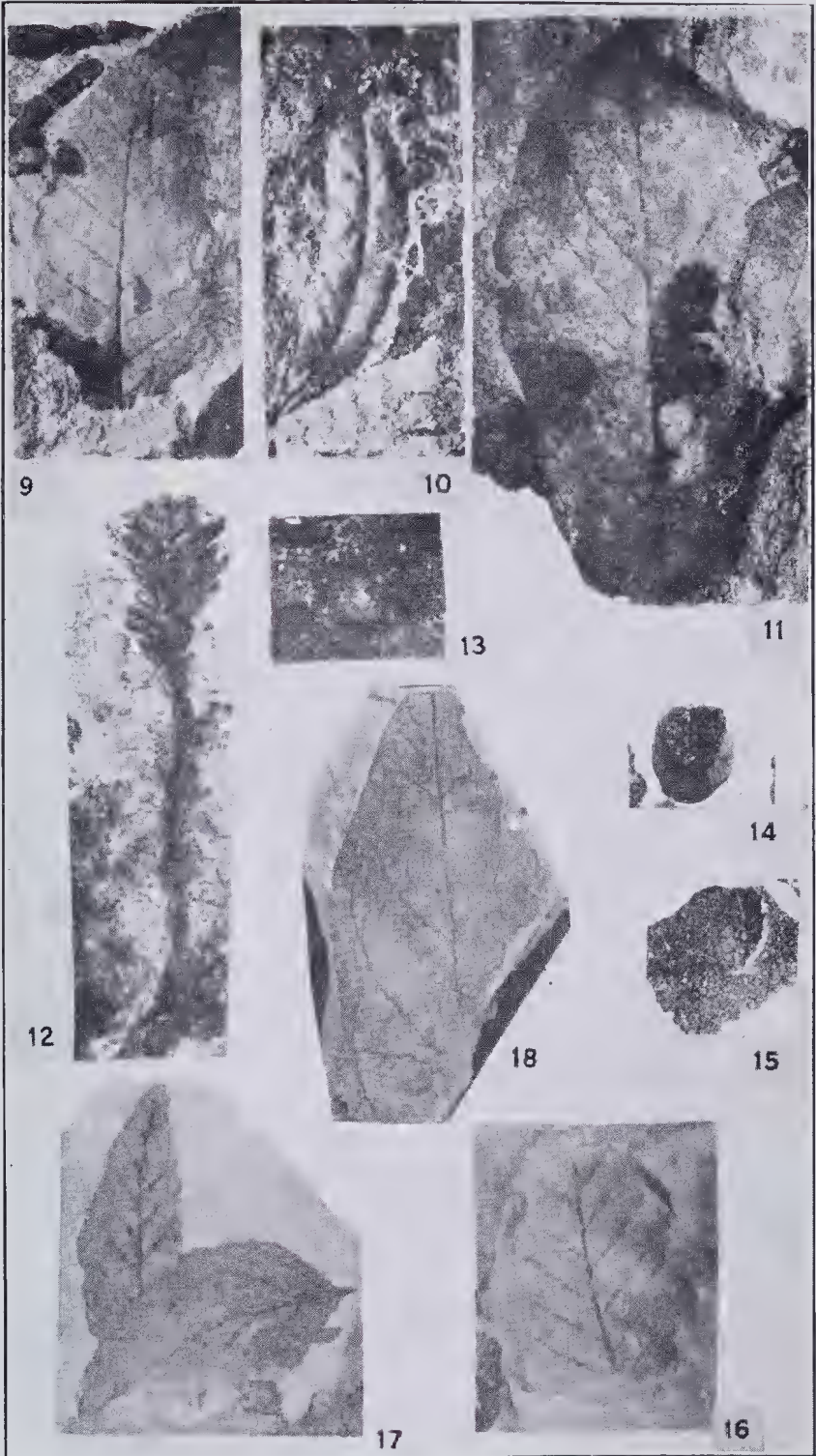




C. W. Brazenor, photo.]

**Tertiary Plant Remains, Narracan.**

NATIONAL MUSEUM OF VICTORIA



C. W. Brazenor, A. A. C. Carter, photo.]

**Tertiary Plant Remains, Narracan and Darlimurla.**